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Impact of distance on migration in Turkey

Turgay Kerem Koramaz ∂
Vedia Dökmeci ±

Abstract

In Turkey, a large gap in economic development has encouraged migration from less developed to more developed provinces. The aim of this study is to study in detail the relationship between migrants and the concentric zones surrounding them from 2007 until 2012. According to the results of the study, the highest amount of migration is shown to be between the origin province and a 400km concentric zone, beyond which they gradually decrease. This pattern is often repeated, but in less populated provinces, which are further from large metropolitan areas, it becomes more homogenous, with unique peaks in the more distant concentric zones.

Keywords: migration; cluster analysis; distance impact; Turkey

Introduction

In recent years, trends in the spatial distribution of population in many countries have undergone dramatic changes caused by inter-regional migration and have stimulated research into its determinants. Previous studies have illustrated that job opportunities and wage and amenity gaps stimulate population movement in developing countries (Billsborrow et al., 1987; Liang, et al., 2002; Chen and Coulson, 2002) as well as in developed ones (Kontully and Schon, 1994; Andreanko and Guriev, 2004). Moreover, the impact of distance over entire population movements has been recognized since Ravenstein's (1885; 1889) studies at the end of the 19th century. Lee (1966) emphasized the negative impact of distance on the number of migrants, and Siegel and Woodyard (1974) demonstrated that a city's position in the urban hierarchy will affect the determinants of that city's in-migration by using data from Canada. The present study investigates the impact of distance on in- and out-migration between the provinces and their surrounding concentric zones in Turkey from 2007 until 2012.

The macro-scale research tradition into migration has evolved from a focus on description and analysis of place-to-place migration, with explanatory modelling focusing on place attributes and assigning a central role to the impact of distance on the volume of movement (Greenwood et al., 1991). Distance

∂ Turgay Kerem Koramaz, Istanbul Technical University, Istanbul, Turkey.
E-mail: koramaz@itu.edu.tr

± Vedia Dökmeci, Istanbul Technical University, Istanbul, Turkey.
E-mail: dokmeciv@itu.edu.tr

moved is a critical aspect of most concepts of migration, and only the U.S., England and Sweden have measured migration distances for the country as a whole to allow an analysis of spatial mobility (Schwartz, 1973; Fotheringham, 1981; Long et al., 1988; Lucas, 2001). On the other hand, among the spatial analyses of inter-state migration studies in the U.S., Cushing (1986) emphasized that common state borders are more important than mere distance, especially for those with a metropolitan area located near the state border, and developed four models using migration data from 1975-1980 for the 48 continuous states. The results of the study illustrated that common state borders and bordering metropolitan areas influence interstate population flows.

Yano et al. (2003) compared migration behaviour in Japan and Britain by taking into consideration distance from origin, population size and relative accessibility to other destinations. The results revealed interesting differences in the factors which have important implications for the impacts of migration on the urban systems in both countries. Another comprehensive study by Niedomysl (2011) investigated the motives (education, employment, living environment, housing, social and other reasons) for changing place of residence in Sweden by taking into consideration the characteristics of migrants (age, civil status, education, income, and occupation). According to the results, young people move long distances for education or jobs, whereas older migrants are driven by a variety of non-economic factors.

There have also been studies into the factors which effect migration change through time, such as the example of Bolivar. Ravuri (2004) investigated the predictor variables in and out-migration from Bolivar, an industrial city in Venezuela, between 1961 and 1990. The results indicated that in 1961, immigrants responded to distance, while in 1990 immigrants responded to distance, population and industry. Kupiszewski et al. (1998) conducted a two-stage investigation into the impact of distance between origin and destination on migration in Poland. First, the migration behaviour of the rural population to the nearest town with a population of 10,000 or more was analysed. In the second stage, the relationships between the migration behaviour from towns below 25,000 and cities with a population of 100,000, and the distances between them were investigated. According to the results, while migration to larger towns decreased, migration to smaller towns increased.

Moreover, a number of studies have established that there is a negative relationship between the migration volume between two places and the distance between them (Skeldon, 1990; Lucas, 2001; Li, 2004; Pekkala et al., 2007). Given this, it is reasonable to expect that closely clustered spatial units will exhibit closer inter-connection than distant units. These proximate clusters or subsystems of migration can be meaningfully delineated as migration subsystems (Pandit, 1994).

Furthermore, Cadwallader (1992) noted that distance is actually a surrogate for a number of variables such as the level of information flow about employment prospects and the physical and psychological costs of moving.

Thus, a high degree of job information exchange between contiguous areas may allow them to act as a single labour market and thereby increase their mutual migration flows. Similarly, shorter moves are generally associated with lower costs of moving; therefore physically proximate areas are likely to have higher levels of population exchange than those which are distant from each other (Pandit, 1994). In Russia, Korel and Korel (1999) found that geographic location is more important than income, price of housing and total unemployment rate to attract migrants. In Poland, Ghatak et al. (2008) showed that among other variables, distance has a strong effect on regional migration.

On the other hand, distance may not always be an appropriate surrogate for information about a location or the costs of moving. In certain contexts it is possible for migrants to be more knowledgeable about, and more attracted to, a distant location than one which is closer (Gedik, 1997; Yazgi et al., 2014). In Gedik's (1997) comprehensive study which took into consideration several factors that affect migration in Turkey; a special emphasis was given to the role of distance. According to the results of the study (which offer a significant contradiction with the findings of this paper), for 1965-1970, a smooth functional relationship with respect to distance could not be obtained. In other words, at distances above an average of 400km migrants moved in a leap-frog fashion toward one of three metropolitan areas regardless of the distances involved. The metropolitan areas, attractive to most of the possible migrants and having high population growth, represent spatial and functional evolution of a central place hierarchy, either. Growth poles, shaped by dominant economic activities, need huge labour forces, significantly in the favour of urban settlements in high level of central place hierarchy, thanks to high amount of migration flows (Olsson, 1965; Parr, 1973; Cromley and Hanink, 2008). Considering central place theory, degree of spatial mobility, associated with interprovincial migration in this paper, also has a significant effect on the level of hierarchy besides many determinants like income, transportation facilities, economic activities and sectoral distribution of labour force (Mutlu, 1988).

Socio-psychological distances seem to be more meaningful than physical distances, and if there are already migrants such as relatives, friends or people from the hometown, that destination is preferred over other physically closer destinations. This fact has been empirically observed in numerous cases of canalized and chain migration (White and Woods, 1980) where strong family and friendship ties draw persons from one region to another regardless of distance and cost. Another instance where the distance surrogate is inappropriate is return migration; studies show that migrants frequently go back to where they grew up as a result of the nostalgia that they feel for their hometown (Rodriges et al., 2002; Michielin et al., 2008; Bijker and Haartsen, 2012). In particular, people born in rural areas are more prone to return at an older age compared to those born in urban settings (Lundholm, 2012).

For retirement migration, there are also factors which effect mobility such as climate, affordability of housing, the availability of cultural and educational opportunities, and access to public services or lack of them (Portnov, 1998; Ishikawa and Montari, 2003). For instance in the U.S., some of these factors played an important role for the transition of the north-eastern "core" which lost to all other regions, and especially to a southwestern "periphery", which gained from all other regions (Morrill, 1988) regardless of the distance.

While the factors which effect migration have been well documented in many other parts of the world, there have been few studies in the case of Turkey aside from Munro (1974), Skeldon (1990), Potter (1993), Gedik (1997), Tekeli (2008), Gökhan & Filiztekin (2008), and Yazgi et al. (2014). The present paper is intended to add to this total by illustrating the impact of distance on in- and out-migration between the provinces and the concentric zones surrounding them from 2007 until 2012 in order to discuss the aforementioned variable of distance. The organization of the paper is as follows. The migration pattern in Turkey and the resulting urbanization are given in the second section. The third section analyses the impact of distance on in- and out-migration streams between the provinces and the concentric zones at the country and provincial levels. The final section is devoted to a conclusion and suggestions for further research.

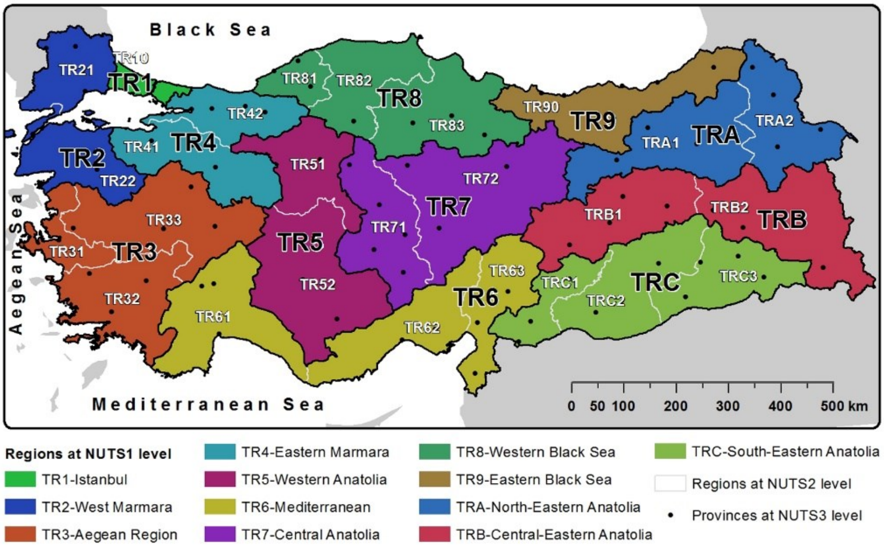
Migration patterns in Turkey

During the second half of the 20th century, regional divergence in the economic development of Turkey was accompanied by a marked increase in inter-provincial migration and sharply concentrated migration flows, especially from relatively poor eastern and south-eastern provinces to the rapidly developing western regions. During this period, the country experienced a rapid urbanization process (Dokmeci and Berkoz, 1994; Arslanli et al., 2011) which came about as a result of rural to urban migration and market adjustment to the inter-sectoral shift away from agriculture and towards manufacturing and services. This process was mainly caused by the great differences between the east and west: high population growth rate, shortage of land in rural areas, partial mechanization of agriculture, the socio-economic attractiveness of cities and especially the construction of highways (Potter, 1993) and spatial distribution and the gravity of the 6th level centres in Turkey Istanbul, Ankara, İzmir, Adana and Gaziantep (SPO, 1982; Zeyneloglu, 2008). As aimed to investigate in this paper, 6th level centres in Turkey are assumed to have broader influence zone in migration flows which extends to more than the lower level centres of central place hierarchy.

Between 1950 and 2000, the population increased from 20.5 to 67.80 million and the urbanization ratio rose from 25% to 64.9%. Although the figures from the Turkish National Census in 2000 reported a rapid transformation of society from rural to urban, more than half of the population of 26 of the 81 provinces are still rural, especially those in the Black Sea, and the Central and East Anatolia regions. In 2012, the population increased to 75.63 million and the urbanization ratio rose to 77.3%. The population growth rates in the last decade account for the significant continuous change in the urbanized population pattern, and as a result, only seven provinces (out of 81) have mostly rural settlements (TUIK, 2012).

Between 2007 and 2012, only 27 provinces (33%) had positive net migration. The spatial distribution of in-migration in 2012 according to the regions in NUTS 1 level illustrates that the Istanbul region (TR1), achieved the highest migration ratio and had the highest in-migration size (17.55% of all in-migrants). The West-Anatolia region (TR5), covering Ankara had the second highest in-migration size (10.90 % of which Ankara itself accounted for 7.41%). The East Marmara (TR4) region achieved the third highest migration ratios (10.39%, of which Bursa and Kocaeli accounted for 3.14% and 2.77% respectively). The urbanization and the industrialization level and thus development level of these regions are the highest in Turkey. The Mediterranean region (TR6) and the Aegean region (TR3) are also upcoming regions in terms of migration ratio (10.34% for TR6, of which Antalya accounted for 3.69% and 9.78% for TR3, of which Izmir accounted for 4.83%). All the provinces in the East and South-East Anatolia regions had negative net migration with the exception of Gaziantep (1.73%) due to its industrial establishments and higher educational facilities (Table 1). Especially the NUTS 1 Regions, which have negative net-migration sizes, cannot only explained in this statistical level, because of including provincial settlements like Gaziantep as a settlement centre in 6th level in the central place hierarchy.

Figure 1. Regions in Turkey at NUTS1 Level



Thus, for the period between 2007 and 2012, 40.86% of all inter-provincial migration flows was towards eight metropolitan areas, each one with a population of more than 2 million (Adana, Ankara, Antalya, Bursa, İstanbul, İzmir, Kocaeli, and Konya) and 9.80% of the migration flow occurred between them. This fundamental result indicates a significant difference between the prosperous and poor provinces due to the unbalanced distribution of population and income in the country. Strategies for reducing the possible negative effects in regions that experience excessive out-migration have been considered in tandem by economists and politicians. Restricting or controlling migration flows in a meaningful manner, however, is generally considered to be a very difficult, if not impossible task (Pekkala, 2003).

Table 1. Population and Migration Pattern of the Regions in NUTS 1 level

Regions	Population (thousand person, 2012)	Total Labour Force (thousand person 15+ age, 2012)	Labour Force Agriculture (%)	Industry (%)	Service (%)	GVA per capita ($, 2011)	Total in-migration (thousand person, 2007-2012)	Total in-migration (%)	Total out-migration (thousand person, 2007-2012)	Total Net-migration (thousand person, 2007-2012)
TR1: Istanbul	13,855	4,493	0.6	36.7	62.7	13,865	2,038	17.55	1,717	321
TR2: West Marmara	3,248	1,247	25.6	28.5	45.9	10,512	607	5.23	509	98
TR3: Aegean	9,780	3,731	30.5	24.2	45.3	9,819	1,389	11.97	1,310	79
TR4: East Marmara	7,058	2,554	17.1	38	44.9	12,679	1,205	10.38	961	243
TR5: West Anatolia	7,253	2,343	13.4	23.3	63.3	10,657	1,137	9.79	970	166
TR6: Mediterranean	9,611	3,204	29.7	19.4	50.9	7,708	1,387	11.95	1,380	7
TR7: Central Anatolia	3,853	1,262	39.4	21.3	39.3	6,934	636	5.48	774	-138
TR8: West Black Sea	4,484	1,667	43.1	17.9	39	7,271	815	7.02	950	-135
TR9: East Black Sea	2,545	1,031	55.2	13.4	31.4	6,652	536	4.61	569	-33
TRA: Northeast Anatolia	2,226	671	47.6	12.7	39.6	4,955	365	3.15	549	-183
TRB: Middle East Anatolia	3,756	1,079	41.7	17.6	40.7	4,569	569	4.9	764	-195
TRC: Southeast Anatolia	7,958	1,539	23.3	28.1	48.6	4,598	924	7.96	1,155	-231
TURKEY	**75,627**	**24,821**	**24.6**	**26**	**49.4**	**9,244**	**11,609**	**100**	**11,609**	

Despite the regional policies to reduce inter-regional disparities since the 1960s, a large gap between socio-economic characteristics has continued to exist between the east and west of the country. For instance, according to the Report on Household Labour Force Statistics (2012), the spatial distribution of the industrial sector ratio shows that the East Marmara region (TR4), which covers eight provinces including Bursa and Kocaeli; the most populated and attractive provinces for industrial labour force, has the highest ratio (38.0%). The Istanbul Region (TR1) has the second highest ratio (36.7%). The Northeast Anatolia (TRA) and East Black Sea (TR9) regions have the lowest industrial employment ratios of 12.7% and 13.4% respectively. On the other hand, the agricultural employment ratios are the highest in these regions (47.6% and 41.7%). Service sector employment, the number of university and high school students and hospital beds/population ratios are relatively greater in the western regions, including the West Anatolia region (TR5) which includes the capital of the country.

At the same time, the privatization of many government establishments increased unemployment and caused an eventual increase in inter-regional migration flows, which further also increased the income gap between the east and west of the country (Dogruel and Dogruel, 2011). There is also a large gap between these regions with respect to per capita gross value added (GVA). While GVA is the lowest (4,569 dollars) in the Middle East Anatolia (TRB) region, the Istanbul region (TR1) has the highest (13,865 dollars) three times more than lowest figures. The East Marmara region (TR4), has the second highest GVA per capita (12,679 dollars). These figures reflect similar rates for industrial employment (TUIK, 2011). Similarly, the highest unemployment ratios are in the provinces of the TRB2 region (higher than 16%) which represents a significant difference between the eastern and the western provinces (TUIK, 2011).

It seems that as the discrepancy continues among the regions of Turkey, migration will also continue between the east and west of the country. According to Gezici and Hewings (2007), there was no convergence regarding regional development between 1980 and 1997. Similarly, studies in other developing countries show that there has been no convergence in Greece (Siriopoulos and Asterion (1998) or in India (Sachs and Ramiah, 2002). On the other hand, it has been illustrated that convergence exists in some developed countries such as the U.S. (Barro and Sala-I-Martin, 1992), Finland (Kangasharzu, 1998) and Sweden (Bergström, 1998). As a result of this trend, while inter-regional migration decreases in developed countries (Öberg, 1995; Bover and Veilla, 1999), it will continue to increase in developing countries since migration is an adjustment mechanism that allows a traditional society to adapt to post-modern privatization, production and consumption.

Thus, patterns of population mobility are illustrated in Turkey by taking into consideration distances between the origin and destination provinces with their surrounding concentric zones in the following section.

Impact of distance on migration in Turkey

In most of the previous studies, distance is a significant variable effecting migration. This variable represents the sensitivity of a migrant's destination choice decision and is commonly referred to as a distance-decay parameter. The distance between each origin and the potential destinations is used to measure the monetary and psychological costs of moving (Newbold and Peterson, 2001). Distance is also a proxy for the amount of information about a destination. It is assumed that the individual will have less information about distant places and will therefore be less likely to choose those destinations (Pandit, 1994).

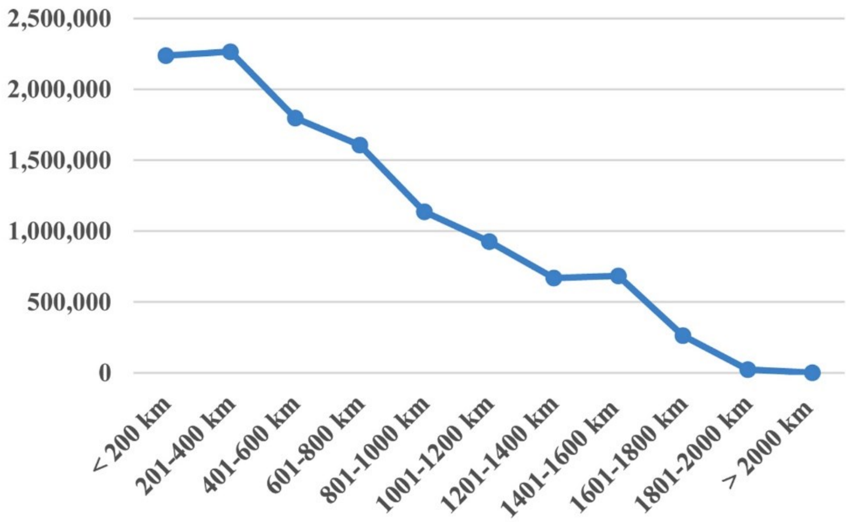
Cluster analysis method

In this study, to investigate the impact of distance on migration in more detail, firstly hierarchical cluster analysis using the nearest neighbour method is conducted. The variables of in and out-migration sizes at the provincial level are determined in order to detect the provinces which are assumed not to belong to any cluster and are not compiled for more than one province. Then hierarchical cluster analysis using the furthest neighbour method is used to obtain clusters which have similar pattern in terms of distance and population size. In order to validate the cluster analysis, the amount of in and out-migration between points of origin and the 200km. concentric zones is analysed according to the variances between the clusters. In addition, a framework for the migration flows within the clusters is also described. The expectation is for a significant correlation between the number of migrants to provinces from the point of origin in the 200km. concentric zone and the cluster groups. The Address Based Population Registration System has been used as the data source (TUIK, 2012) for the analysis of internal migration for the period between 2007 and 2012. This was officially published as the first five-year period of the recent population registration system. Distances between the provinces were taken from the official data published by the General Directorate of Highways and are calculated from the distances between the administrative centres and the most populated central settlements of the provinces.

In this part of the paper, the impact of distance on in- and out-migration between the provinces and the concentric zones surrounding them is investigated at the country and cluster level. The migration between the point of origin and the 200-400km. concentric zone has the highest amount of migrants: 2,265,405, and 0-200km. concentric zone has 2,237,046 migrants (Fig. 2). As expected from the conventional distance based migration studies, the closest concentric zone should have the highest migration size. However the spatial representation of this result (not the statistical result itself) shows that the highest migration is still between the growth centre and the nearest provinces (Cushing, 1986; Pandit, 1994). After the second concentric zone, migration declines sharply as the distance increases, which is also in line with expectations.

At the first stage of the analysis, a cluster analysis is conducted in order to identify clusters of migration flows that are dependent on distance. The dataset used in this study contains 12 migration size variables at differing distance intervals between points of origin and 200km, and concentric zones such as in and out migration sizes at 0-200km, 201-400km, 401-600km, 601-800km, 801-1000km and greater than 1000km were established.

Figure 2. Migration sizes in Turkey, changing at 200km distance intervals

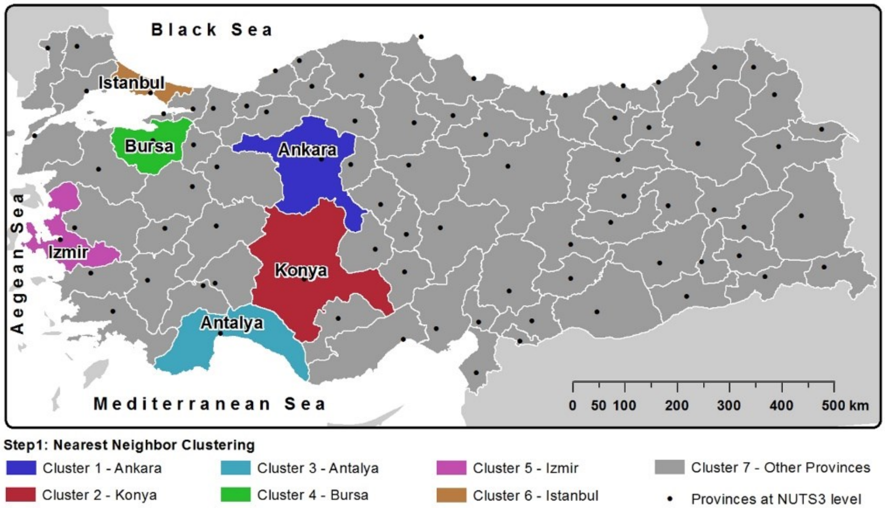


As can be seen in the table 2, the variables produce concrete differences in the population sizes, migrating in each concentric zone. In the first step of the cluster analysis, anomaly detention is required in cases where provinces are assumed to belong to a cluster while anomalies (or outliers) do not (Chandola et al., 2009). In this step, a hierarchical cluster analysis using the nearest neighbour clustering method is used where distance between nearest neighbour is assumed to be the smallest distance among the instances (Ertöz et al., 2003), or in other words, anomalies are further away from the nearest cluster centroid (Thiprungsri & Vasarhelyi, 2011). The results of the nearest neighbour clustering analysis is given in figure below. The results consistently distinguish the provinces which have in-migration sizes higher than 350,000; namely, Istanbul, Ankara, Izmir, Antalya, and Bursa (in-migration sizes of these provinces are respectively: Istanbul = 2,037,830; Ankara = 859,897; Izmir = 560,880; Antalya = 427,961; and Bursa = 364,198), and include the province of Konya, the in-migration size of which is 236,696. The remaining provinces are those which are used for the furthest neighbour clustering method (Fig. 3).

Table 2. The variables, used in the Cluster Analysis and Descriptive Analysis for 81 Provinces

code	variable	mean	std. dev.	min.	median	max.
IN_dist1	In-migration Size in first concentric zone (< 200 km)	27,617.90	30,067.10	652	16,102	167,583
IN_dist2	In-migration Size between the concentric zone of 201 and 400 km	27,968.00	42,833.30	1,465	15,076	284,203
IN_dist3	In-migration Size between the concentric zone of 401 and 600 km	22,193.20	45,102.50	1,048	8,515	267,542
IN_dist4	In-migration Size between the concentric zone of 601 and 800 km	19,831.70	48,161.40	1,273	8,015	411,177
IN_dist5	In-migration Size between the concentric zone of 801 and 1000 km	14,032.50	28,379.80	1,066	5,289	225,746
IN_dist6	In-migration Size for the furthest concentric zone (> 1000 km)	31,672.20	83,326.30	148	16,437	732,798
IN_TOT	**Total In-migration Size**	**143,315.40**	**246,562.10**	**17,742**	**79,710**	**2,037,830**
OUT_dist1	Out-migration Size in first concentric zone (< 200 km)	27,617.90	30,938.70	668	18,600	223,737
OUT_dist2	Out-migration Size between the concentric zone of 201 and 400 km	27,968.00	37,191.60	1,623	15,283	236,180
OUT_dist3	Out-migration Size between the concentric zone of 401 and 600 km	22,193.20	41,684.30	852	10,426	250,866
OUT_dist4	Out-migration Size between the concentric zone of 601 and 800 km	19,831.70	41,496.60	1,215	9,486	345,737
OUT_dist5	Out-migration Size between the concentric zone of 801 and 1000 km	14,032.50	26,143.30	1,134	5,636	196,783
OUT_dist6	Out-migration Size for the furthest concentric zone (> 1000 km)	31,672.20	59,458.40	141	14,300	484,389
OUT_TOT	**Total Out-migration Size**	**143,315.40**	**203,205.60**	**22,804**	**96,004**	**1,716,848**

Figure 3. Step 1. Nearest Neighbour Clustering of the Provinces in Turkey generated by in and out-migration sizes



The results of nearest neighbour clustering analysis indicated a spatial distribution which peaks between 200 and 600km and which mainly corresponds to distance between these metropolitan provinces (Fig. 4). When considering the most populated provinces with highest in and out-migration sizes (Istanbul, Ankara, İzmir, Bursa, Antalya and Konya), the statement 'migration among large metropolitan areas produces the biggest amount of migration flow in Turkey' is validated (given as 40.86% in the previous section). As another proof of this figure, the migration between six of the metropolitan provinces is 891,117 and equals 7.68% of the entire inter-provincial migration flow in Turkey. Since the provinces with a population of more than two million (as Adana and Kocaeli are excluded from the results nearest neighbouring cluster analysis) are included in the first step of cluster analysis, the nearest neighbour clustering method is successful for the detection of anomalies (or outliers) in migration flow pattern. The exceptional condition of Adana and Kocaeli can be defined by the migration flow among inter-metropolitan provinces. Among the eight most populated provinces, only Adana and Kocaeli have different patterns in terms of origin provinces. For instance, Adana has mass in-migration flows from Istanbul and mostly neighbouring provinces like Icel, Mardin, Osmaniye, Sanliurfa and Hatay. Similarly, Kocaeli has mass in-migration from Sakarya. Since in-migration is higher than out-migration for these provinces (except Konya), all of them are significantly affected by the spread of urbanization with respect to industrial establishments and housing.

In the second step of the cluster analysis, the furthest neighbour clustering method is used. The distances are assumed to be the largest possible between two data points. The furthest neighbour clustering method is applied for 75 provinces and the results of the analysis produced nine different clusters (Cluster 1 to 9). Table 3 and Fig. 5 present the clusters generated from the furthest neighbour clustering method. Cluster 9 contains the most number of provinces, with 38, followed by Cluster 3, containing 14 provinces. Cluster 2, 7, and 8 have 5 provinces, and the least number of province is found in Cluster 1 with one province: Kocaeli. As mentioned above, Kocaeli is an important centre for industrial employment, and attracts migrants from not only its neighbouring provinces but also from the furthest provinces in Turkey (Fig. 5, Cluster-1).

Figure 4. Migration sizes, changing at 200km distance intervals in the provinces detected by nearest neighbour clustering (x axis presents the migration sizes in thousand persons; y axis presents the distance intervals in km)

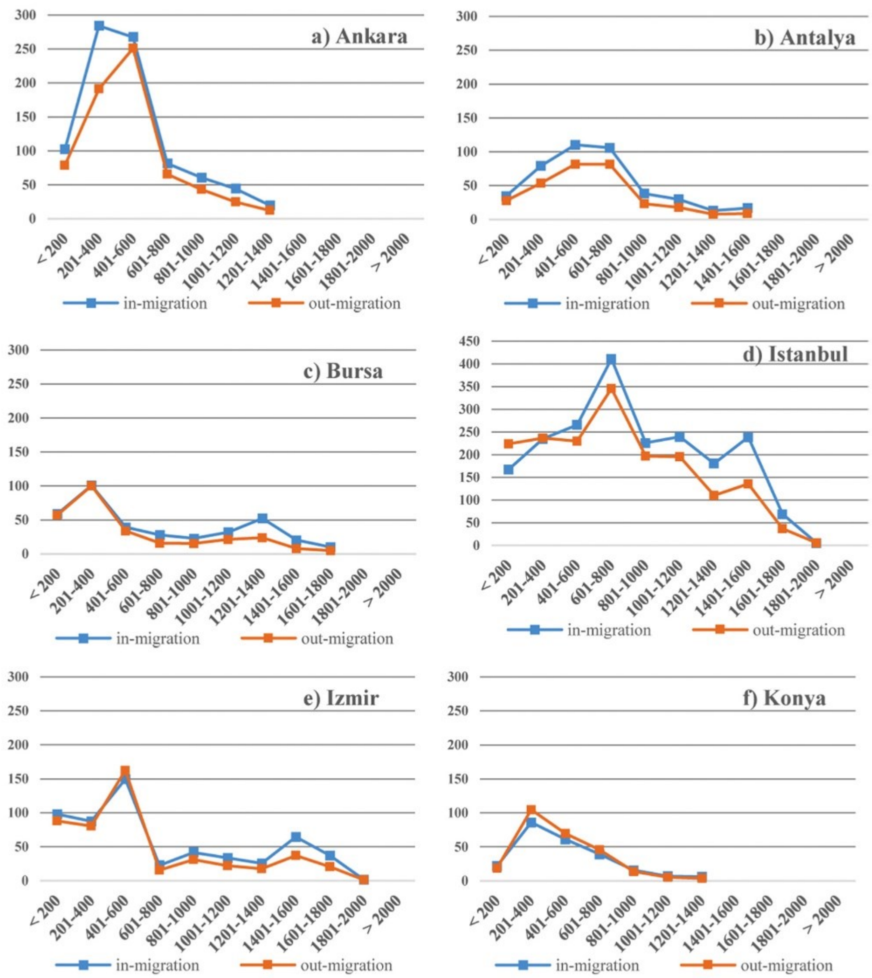


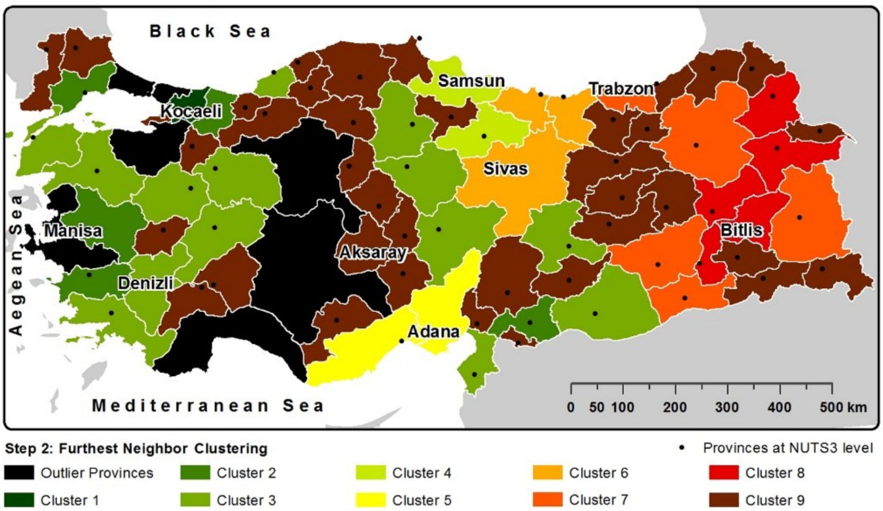
Table 3 shows population sizes and the in and out-migration sizes of each cluster. The figures illustrate that most populated provinces (black in Fig. 5), which are distinguished with nearest neighbour clustering method, have the highest in- and out-migration levels. The first two clusters with positive net-migration are neighbouring first step clusters, and are located in the west (the most attractive region for migrants). The last three clusters except Cluster-9 (Cluster-6, Cluster-7, and Cluster-8) are mainly accumulated in the eastern part

Table 3. Population and migration sizes in the clusters

Clusters		Population	In-migration	Out-migration	Net Migration
Step 1: Nearest Neighbour Clustering					
Ankara, Antalya, Bursa, Istanbul, Izmir, and Konya	6 provinces	29,658,730	4,487,462	3,703,486	783,976
Step 2: Furthest Neighbour Clustering					
Cluster 1 Kocaeli	1 province	1,634,691	322,044	246,119	75,925
Cluster 2 Aydin, Gaziantep, Manisa, Sakarya, and Tekirdag	5 provinces	5,906,849	867,215	756,969	110,246
Cluster 3 Afyon, Balikesir, Canakkale, Corum, Denizli, Eskisehir, Hatay, Kayseri, Kutahya, Malatya, Mugla, Sanliurfa, Yozgat, and Zonguldak	14 provinces	12,396,039	1,722,273	1,856,321	-134,048
Cluster 4 Samsun and Tokat	2 provinces	1,865,712	329,027	389,262	-60,235
Cluster 5 Adana and Mersin	2 provinces	3,808,483	492,356	550,734	-58,378
Cluster 6 Giresun, Ordu, and Sivas	3 provinces	1,784,461	357,702	403,836	-46,134
Cluster 7 Diyarbakir, Erzurum, Mardin, Trabzon, and Van	5 provinces	4,953,261	681,518	946,253	-264,735
Cluster 8 Agri, Batman, Bitlis, Kars, and Mus	5 provinces	2,141,943	315,801	494,316	-178,515
Cluster 9 Adiyaman, Aksaray, Amasya, Ardahan, Artvin, Bartin, Bayburt, Bilecik, Bingol, Bolu, Burdur, Cankiri, Duzce, Edirne, Elazig, Erzincan, Gumushane, Hakkari, Igdir, Isparta, K.maras, Karabuk, Karaman, Kastamonu, Kilis, Kirikkale, Kirklareli, Kirsehir, Nevsehir, Nigde, Osmaniye, Rize, Siirt, Sinop, Sirnak, Tunceli, Usak, and Yalova	38 provinces	11,477,215	2,033,149	2,261,251	-228,102
Turkey	**81 provinces**	**75,627,384**	**11,608,547**	**11,608,547**	

of the country. In addition, Cluster-7 can be distinguished from its neighbouring clusters located in the east as it has a relatively higher value for both in and out-migration sizes. This remarkable finding indicates that the provinces in this cluster (Diyarbakir, Erzurum, Mardin, Trabzon, and Van) attract migrants from their neighbouring provinces and then generate out-migrants to the larger metropolitan areas, which represent the hierarchical process of migration. According to the results of the furthest neighbour clustering method, Cluster-3 and Cluster-9 have relatively higher values for in and out migration sizes, and they mostly border the first step clusters in the west, and the sub-centres in the east (Cluster-7). Cluster-3 and Cluster-9 contain the nearest provinces to growth centres and these are distinguished from first step clusters by being regarded as sub-centres in the hierarchical process of migration (Cluster-7).

Figure 5. Step 2. Furthest Neighbour Clustering of the Provinces in Turkey generated by in and out-migration sizes

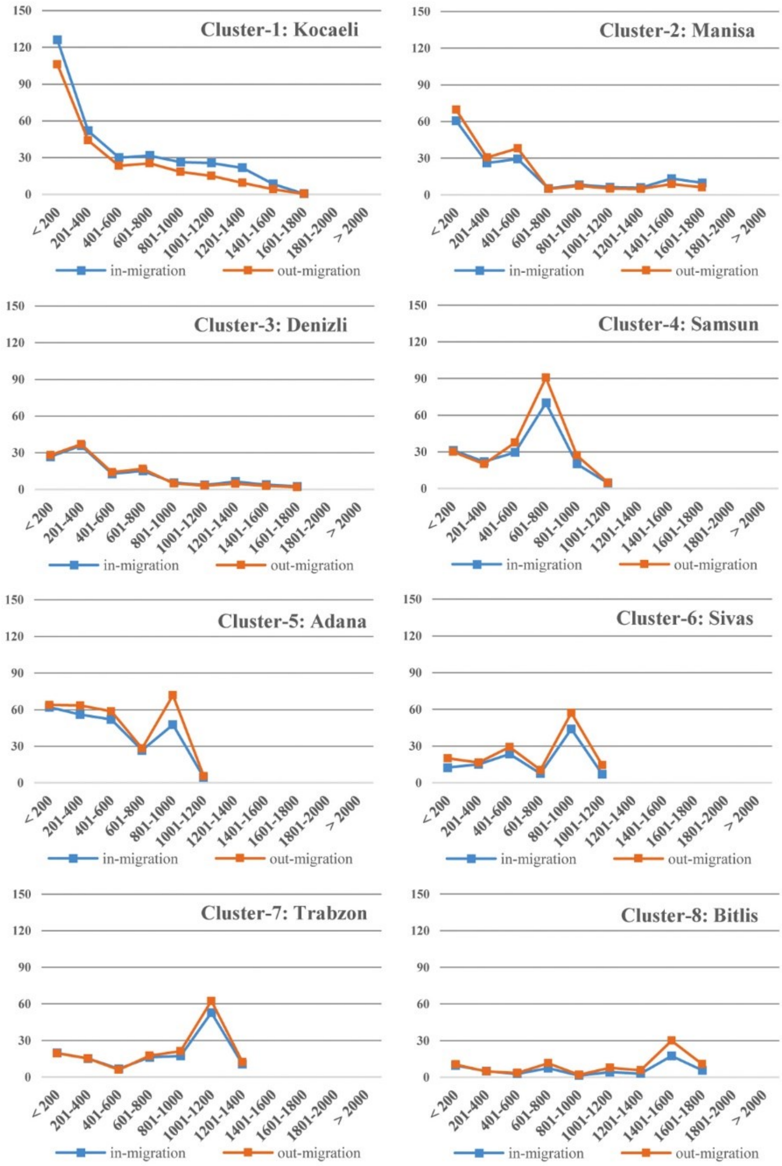


Findings from cluster analysis

After these primary findings, it can be seen that in and out-migration pattern in Turkey is strongly related to distance. The migration levels of provinces within the same cluster vary according to the distance intervals, and this result can also be validated through an examination of regional locations and boundaries (Fig. 6).

In order to represent the impact of distance on migration flows, provinces which have the median value in total in-migration size among all the provinces within the same cluster are selected and shown in the line graphs, depicting migration flow changes in distance intervals within the 200km concentric zones. (Fig. 6). Although the attraction of the most populated metropolitan provinces, especially Istanbul, has had a major influence on the in- and out-migration pattern at the country level, the impact of distance on the in-and out-migration in the provinces located within the western and the eastern clusters reveals different patterns.

The spatial distribution of in- and out-migration in Cluster-1 and Cluster-2



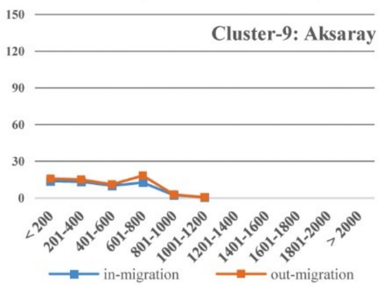


Figure 6. Migration sizes, changing at 200km distance intervals in the provinces picked out from the clusters (x axis presents the migration sizes in thousand persons; y axis presents the distance intervals in km)

reaches a peak between 0-200 km, and then falls sharply as the distance increases (Fig. 6, Kocaeli and Manisa) which is in line with the findings of Cushing (1986) and (Pandit, 1994). The reason for this pattern can be explained by the vicinity of large metropolitan areas within the 0-200km concentric zone (Aydin, Gaziantep, Manisa, Sakarya, and Tekirdag) in Cluster-2. This situation can be apparently explained with the attraction of Adana, İzmir and Kocaeli, which is in line with the situation in many other countries (Haapanen, 2000). In Cluster-2, the attraction of these three major metropolitan provinces also dominates the provinces in its vicinity, and this trend matches the analyses of Cushing (1986) and Pandit (1994). However, its major interaction with respect to in-and out-migration is with major metropolitan provinces such as Istanbul, and Ankara. It receives almost as many in-migrants from eastern and south eastern provinces as it does due to its mild climate and abundant job opportunities.

Cluster-3 has more metropolitan provinces (Afyon, Balikesir, Canakkale, Corum, Denizli, Eskisehir, Hatay, Kayseri, Kutahya, Malatya, Mugla, Sanliurfa, Yozgat, and Zonguldak), and there is more in-migration than out-migration for the concentric rings depending on the distance to its closest major metropolitan province, as shown by the nearest neighbour clustering method. Although in-and out-migration decreases as distance increases, their distribution curves have peaks when the concentric rings include large metropolitan areas such as Izmir, Istanbul, Ankara and Antalya. The provinces with small metropolitan areas have more out-migration than in-migration for up to 2 or 3 nearby concentric rings, but in-migration exceeds out-migration at longer distances. In this way, these provinces act as the middle step in the hierarchical migration process.

For most of the provinces, Istanbul is the major destination, overcoming the distance effect. This is due to its abundant job opportunities and higher educational facilities, as illustrated by Gordon and Lamont (1982) and Gordon and Molho (1998). In these provinces, due to heightened job shortages, longer-distance migration is a more attractive option. Although out-migration is usually higher than in-migration in many provinces, for Cluster-7 (Diyarbakir, Erzurum, Mardin, Trabzon, and Van), the migration pattern is more variable in terms of distance dependency. For instance in Trabzon, as a province in this cluster, there is a more homogenous size distribution in the closest concentric rings (closer than 1000km) but a definite peak between 1000 and 1200km (Fig. 6, Cluster-7). This cluster has more equality in terms of in and out-migration in the closest concentric rings, but has more out-migration, especially to the further and larger metropolitan areas. As previously stated, these provinces attract migrants from their neighbouring provinces, and then generate out-migrants to the larger metropolitan areas, which represents the hierarchical process of migration.

Cluster-9 (Adiyaman, Aksaray, Amasya, Ardahan, Artvin, Bartin, Bayburt, Bilecik, Bingol, Bolu, Burdur, Cankiri, Duzce, Edirne, Elazig, Erzincan, Gumushane, Hakkari, Igdir, Isparta, Kahramanmaras, Karabuk, Karaman, Kastamonu, Kilis, Kirikkale, Kirklareli, Kirsehir, Nevsehir, Nigde, Osmaniye, Rize, Siirt, Sinop, Sirnak, Tunceli, Usak, and Yalova) has more provinces than any other cluster and is spread over the whole country. Its results show that if a province is near a metropolitan area, such as Ankara or Antalya, they are represented by a peak for both the in-and out-migration from the nearby area, and Istanbul's attraction is relatively reduced (Fig. 6, Cluster-9). As seen in the migration sizes of the cases from the line graph in Fig. 6, the provinces within Cluster-4, Cluster-5, Cluster-6 and Cluster-7, play a transitory role due to their central location. They receive migrants from nearby provinces, who then transfer to large metropolitan areas, which have a definite peak according to their distance to Istanbul.

Since a hierarchical cluster analysis with the furthest neighbour method is used, the results of this analysis are validated with analysis of variance (ANOVA) to determine whether the clusters differ significantly. The results of the one-way ANOVA, as applied to Clusters 2 to 9 and which are gathered from the hierarchical cluster analysis with the furthest neighbour method, differ significantly at each concentric zone of the migration flow (Cluster-1 cannot be included in the analysis, because it contains only one province). This would suggest that the clustering of provinces is associated with the migration sizes in their concentric zones (Appendix 1). The magnitude of F values from ANOVA indicates the role of distance effect on migration flow while discriminating between the clusters. The migration flow within the concentric zones plays a significant role in population movement in Turkey, especially the concentric zone beyond 600km.

As an additional test for the hierarchical cluster analysis, an analysis of covariance (ANCOVA) can be conducted in order to determine if the variance between the clusters is consistent with the variables used in the analysis (Wilson and McGrath, 1990). The difference between the means of clusters is then validated with ANCOVA to determine whether the variance between the clusters is significant in terms of the variance in migration sizes in the concentric zones. Each analysis of covariance is conducted with independent variable of Clusters 2 to 9 with the dependent variable of migration size in the concentric zones (IN_dist1, IN_dist2, IN_dist3, IN_dist4, IN_dist5, IN_dist6, OUT_dist1, OUT_dist2, OUT_dist3, OUT_dist4, OUT_dist5, OUT_dist6). The differences between the means of Clusters 2 to 9 to the variance of migration sizes are consistent with ANOVA (Appendix 2).

If the effect of the other factors are removed, the results of ANCOVA also validate whether the error variances of the dependent variables are equal across clusters. Unfortunately, the null hypothesis must be rejected for the error variances of three dependent variables of IN_dist1 (< 200 km), IN_dist3 (401-600 km) and OUT_dist1 (< 200 km). However, for the variance of the in- and out-migration sizes in the rest of the concentric zones, the difference between the means of the Clusters is significant. This result shows that the power of large metropolitan provinces can not only be correlated with migration flows in one direction, but also with the hierarchical migration process, as aforementioned with the case of Kocaeli, which is close to Istanbul, and the provinces in the Aegean region, which are close to Izmir and the other metropolitan centres.

Conclusion

The analysis in this paper may attract the attention of most migration researchers. In many instances, the methods used to analyse the determinants which impact inter-provincial migration do not reveal the spatial interdependent impact of distance on migration. Additionally, the paper demonstrates a two-step clustering method capable of identifying major and minor metropolitan provinces which attract migrants through hierarchical migration processes. Thus, the present study investigates the gradual impact of distance on in- and out-migration between the provinces and the concentric zones around them. This analysis is conducted at the country and provincial cluster levels.

First, in- and out-migration is investigated at the country level between the provinces and the concentric zones surrounding them. The results of the analysis reveal that the highest peak is between 200-400km. from the point of origin or destination, and then migration sharply decreases as the distance increases, which is within the range of the previous studies.

Second, the in- and out-migration trend is analysed between the provinces and the concentric zones surrounding them for each province. The results of the analysis reveal that Istanbul is the major attraction for the in- and out-migration of the provinces within the Marmara, Black Sea, East and South East Anatolia regions whatever the distance. For the provinces in the Aegean region, Izmir is the major attraction for the in- and out-migration of the provinces and the draw of Istanbul is reduced. On the other hand, Istanbul is still the major attraction for the Izmir metropolitan area. So, Izmir as the regional centre collects migrants from its surroundings and from the East and South East regions and transfers them to a higher order in the urban hierarchy, which represents the hierarchical migration pattern in the country. Generally, there is more in-migration than out-migration for these provinces, and for both of them it decreases as the distance increases. However, there is a smaller peak which corresponds to Cluster-7 (Diyarbakir, Erzurum, Mardin, Trabzon, and Van) despite the long distance to the Izmir metropolitan area. In addition, there is generally more in-migration than out-migration for the provinces in the Mediterranean region except Hatay, Maras and Adana due to factory closures. In this region, while Antalya is the major draw, for the neighbouring provinces, Istanbul, Ankara and Izmir are more attractive for the local major metropolitan areas which represents the high amount of in- and out-migration among the inter-metropolitan areas and also another example of a hierarchical pattern of migration. For the provinces in Central Anatolia, the Ankara metropolitan area is the major draw. However, its attractiveness is challenged by the other metropolitan areas, such as Istanbul and Izmir for some of the provinces which are located between the regions, such as Eskisehir. Thus, the general difference between the in- and out-migration of provinces in the east and west is that migration decreases as the distance increases for the provinces in the west, the reverse is true for the provinces in the east due to the wide socio-economic differences.

Although continuous migration from the east provides cheap labour for the industries in the west of the country, it also increases socio-economic differences between the east and the west of the country. However, according to previous studies, a more even spread of economic activity could reduce inflation and increase national output. It may also be important in preserving the environment and quality of life of those living in the most prosperous part of Turkey, namely the Marmara and Aegean regions.

At the same time, the findings presented here suggest that migration holds important implications for broad internal redistribution patterns of the population – both directly and indirectly – by influencing an internal migration dominated by the major metropolitan areas due to their large employment and educational opportunities, as already illustrated by Yazgi et al. (2014).

Furthermore, this study provides background for future studies showing how historical movements have led to the gradual transformation of significantly large areas, in that whole cultures and societies diffused spatially, and institutions and artefacts were transported. Future migration research is suggested to incorporate the economic determinants of evolving spatial patterns in a temporal perspective together with life-cycle influences on migration by taking into consideration the education level and professions of migrants.

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Appendix 1: Results of the one-way ANOVA for migration sizes for each concentric zone on clusters (2 to 9)

	IN_dist1 (< 200 km)			IN_dist2 (201-400 km)			IN_dist3 (401-600 km)			IN_dist4 (601-800 km)			IN_dist5 (801-1000 km)			IN_dist6 (> 1000 km)		
	Mean	Std.Dev.	Std. Err.	Mean	Std.Dev.	Std. Err.	Mean	Std.Dev.	Std. Err.	Mean	Std.Dev.	Std. Err.	Mean	Std.Dev.	Std. Err.	Mean	Std.Dev.	Std. Err.
Cluster 2 (N=5)	76274.8	20958.3	9372.8	19940.8	9276.6	4148.6	20094.2	6334.8	2833.0	13452.0	7788.7	3483.2	11444.8	6011.9	2688.6	32236.4	11199.5	5008.6
Cluster 3 (N=14)	25837.6	13305.7	3556.1	39124.9	12155.7	3248.8	14342.3	6246.7	1669.5	16486.8	12509.6	3343.3	8601.3	5139.4	1373.6	18626.6	15599.6	4169.2
Cluster 4 (N=2)	20036.0	15697.8	11100.0	23953.5	2857.4	2020.5	19880.0	13620.3	9631.0	81554.0	16399.2	11596.0	16392.5	5128.7	3626.5	2697.5	2536.4	1793.5
Cluster 5 (N=2)	49567.0	17536.3	12400.0	50577.5	7554.0	5341.5	59385.0	10428.4	7374.0	32782.5	8648.6	6115.5	48952.5	1699.2	1201.5	4913.5	713.5	504.5
Cluster 6 (N=3)	15742.7	5097.5	2943.0	9944.0	4598.9	2655.2	13607.7	9992.5	5769.2	11832.0	4278.1	2470.0	59981.0	22990.4	13273.5	8126.7	3458.7	1996.9
Cluster 7 (N=5)	17583.0	12963.8	5797.6	17711.2	6119.4	2736.7	13100.6	7391.4	3305.5	9118.0	4479.1	2003.1	14126.4	3514.8	1571.9	64664.4	10483.6	4688.4
Cluster 8 (N=5)	9235.0	9312.3	4164.6	6754.8	2222.3	993.8	2992.4	818.2	365.9	4959.8	2079.6	930.0	3295.4	1564.7	699.8	35922.8	6974.7	3119.2
Cluster 9 (N=38)	14848.5	10434.2	1692.7	10337.8	6948.2	1127.2	7713.8	7101.3	1152.0	6681.2	5536.4	898.1	3431.2	2046.0	331.9	10491.5	9329.1	1513.4
F-value	18.869			25.087			17.803			29.568			66.336			20.91		
df	7			7			7			7			7			7		
sig.	0			0			0			0			0			0		

Appendix 1: Continued…

	OUT_dist1 (< 200 km)			OUT_dist2 (201-400 km)			OUT_dist3 (401-600 km)			OUT_dist4 (601-800 km)			OUT_dist5 (801-1000 km)			OUT_dist6 (> 1000 km)		
	Mean	**Std.Dev.**	**Std. Err.**	**Mean**	**Std.Dev.**	**Std. Err.**	**Mean**	**Std.Dev.**	**Std. Err.**	**Mean**	**Std.Dev.**	**Std. Err.**	**Mean**	**Std.Dev.**	**Std. Err.**	**Mean**	**Std.Dev.**	**Std. Err.**
Cluster 2 (N=5)	49460.5	20422.0	14440.5	56661.0	9565.7	6764.0	64592.0	8365.1	5915.0	31797.0	5053.0	3573.0	67153.5	6555.6	4635.5	5703.0	277.2	196.0
Cluster 3 (N=14)	19478.0	14764.4	10440.0	26343.0	8790.8	6216.0	24132.5	18750.4	13258.5	98427.5	11038.6	7805.5	23291.5	5371.9	3798.5	2958.5	2689.1	1901.5
Cluster 4 (N=2)	16262.9	11683.2	1895.3	10615.0	7101.2	1152.0	8133.1	7307.4	1185.4	7806.0	7131.8	1156.9	3626.3	2671.7	433.4	13063.3	13588.1	2204.3
Cluster 5 (N=2)	26204.3	13742.8	3672.9	45078.4	13169.8	3519.8	15086.4	5663.1	1513.5	18451.4	13829.4	3696.1	8906.6	6837.1	1827.3	18867.3	20578.0	5499.7
Cluster 6 (N=3)	8197.2	6257.0	2798.2	7548.0	2778.6	1242.6	3472.6	904.2	404.4	6318.2	3358.2	1501.8	4581.4	2364.2	1057.3	68745.8	15792.2	7062.5
Cluster 7 (N=5)	64634.0	5656.1	2529.5	20007.0	9145.8	4090.1	20546.8	10535.5	4711.6	13931.6	10405.0	4653.3	8161.0	2256.4	1009.1	24113.4	11401.6	5099.0
Cluster 8 (N=5)	18912.8	15476.3	6921.2	17090.2	3900.7	1744.5	15929.2	10901.7	4875.4	11197.6	4495.3	2010.4	19016.8	4096.3	1831.9	#######	27367.6	12239.2
Cluster 9 (N=38)	18719.3	4079.7	2355.4	10379.7	5565.1	3213.0	16144.0	13048.5	7533.6	12707.7	3429.8	1980.2	64317.7	13526.2	7809.4	12343.7	5289.5	3053.9
F-value	13.155			31.59			16.973			31.358			118.42			28.653		
df	7			7			7			7			7			7		
sig.	0			0			0			0			0			0		

Appendix 2: Results of Analysis of Covariance on the Difference in Concentric Zones in Clusters (2 to 9)

Dependent Variable:IN_dist1	*R Squared = .667, Adjusted R Squared = .631, p=,109*				
Source of variance	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Intercept	2.59E+10	1	2.59E+10	175.654	0
Clusters	1.94E+10	7	2.78E+09	**18.869**	**0**
Residual	9.71E+09	66	1.47E+08		
Total	6.50E+10	74			

Dependent Variable:IN_dist2	*R Squared = .727, Adjusted R Squared = .698, p=0,042*				
Source of variance	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Intercept	1.57E+10	1	1.57E+10	238.784	0
Clusters	1.15E+10	7	1.65E+09	**25.087**	**0**
Residual	4.33E+09	66	6.56E+07		
Total	4.02E+10	74			

Dependent Variable:IN_dist3	*R Squared = .654, Adjusted R Squared = .617, p =,352*				
Source of variance	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Intercept	1.12E+10	1	1.12E+10	228.408	0
Clusters	6.13E+09	7	8.76E+08	**17.803**	**0**
Residual	3.25E+09	66	4.92E+07		
Total	1.97E+10	74			

Dependent Variable:IN_dist4	*R Squared = .758, Adjusted R Squared = .733, p=,003*				
Source of variance	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Intercept	1.54E+10	1	1.54E+10	261.377	0
Clusters	1.22E+10	7	1.74E+09	**29.568**	**0**
Residual	3.89E+09	66	5.89E+07		
Total	2.67E+10	74			

Dependent Variable:IN_dist5	*R Squared = .876, Adjusted R Squared = .862, p=,000*				
Source of variance	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Intercept	1.36E+10	1	1.36E+10	502.062	0
Clusters	1.26E+10	7	1.80E+09	**66.336**	**0**
Residual	1.79E+09	66	2.71E+07		
Total	2.11E+10	74			

Dependent Variable:IN_dist65	*R Squared = .689, Adjusted R Squared = .656, p=,002*				
Source of variance	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Intercept	1.55E+10	1	1.55E+10	135.867	0
Clusters	1.68E+10	7	2.39E+09	**20.91**	**0**
Residual	7.55E+09	66	1.14E+08		
Total	4.94E+10	74			

Dependent Variable:OUT_dist1 *R Squared = .583, Adjusted R Squared = .538, p=,333*

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Intercept	2.42E+10	1	2.42E+10	169.87	0
Clusters	1.31E+10	7	1.88E+09	**13.155**	**0**
Residual	9.42E+09	66	1.43E+08		
Total	5.88E+10	74			

Dependent Variable:OUT_dist2 *R Squared = .770, Adjusted R Squared = .746, p=,000*

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Intercept	1.85E+10	1	1.85E+10	255.251	0
Clusters	1.60E+10	7	2.29E+09	**31.59**	**0**
Residual	4.78E+09	66	7.24E+07		
Total	4.94E+10	74			

Dependent Variable:OUT_dist3 *R Squared = .643, Adjusted R Squared = .605, p=0,022*

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Intercept	1.39E+10	1	1.39E+10	225.032	0
Clusters	7.34E+09	7	1.05E+09	**16.973**	**0**
Residual	4.08E+09	66	6.18E+07		
Total	2.35E+10	74			

Dependent Variable:OUT_dist4 *R Squared = .769, Adjusted R Squared = .744, p=,000*

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Intercept	1.98E+10	1	1.98E+10	256.586	0
Clusters	1.70E+10	7	2.42E+09	**31.358**	**0**
Residual	5.10E+09	66	7.72E+07		
Total	3.59E+10	74			

Dependent Variable:OUT_dist5 *R Squared = .926, Adjusted R Squared = .918, p=,000*

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Intercept	1.95E+10	1	1.95E+10	907.108	0
Clusters	1.78E+10	7	2.55E+09	**118.42**	**0**
Residual	1.42E+09	66	2.15E+07		
Total	2.78E+10	74			

Dependent Variable:OUT_dist65 *R Squared = .752, Adjusted R Squared = .726, p=,020*

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Intercept	3.15E+10	1	3.15E+10	122.881	0
Clusters	5.14E+10	7	7.34E+09	**28.653**	**0**
Residual	1.69E+10	66	2.56E+08		
Total	1.13E+11	74			